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PHASE II FINAL REPORT ON USE OF AIR FORCE ADP EXPERIENCE TO ASSIST AIR FORCE ADP MANAGEMENT

VOLUME I

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Alan J. Gradwohl
George S. Beckwith
Stanton H. Wong
Wolford O. Wootan, Jr.

December 1966

TACTICAL PLANNING DIVISION
DIRECTORATE OF PLANNING AND TECHNOLOGY
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
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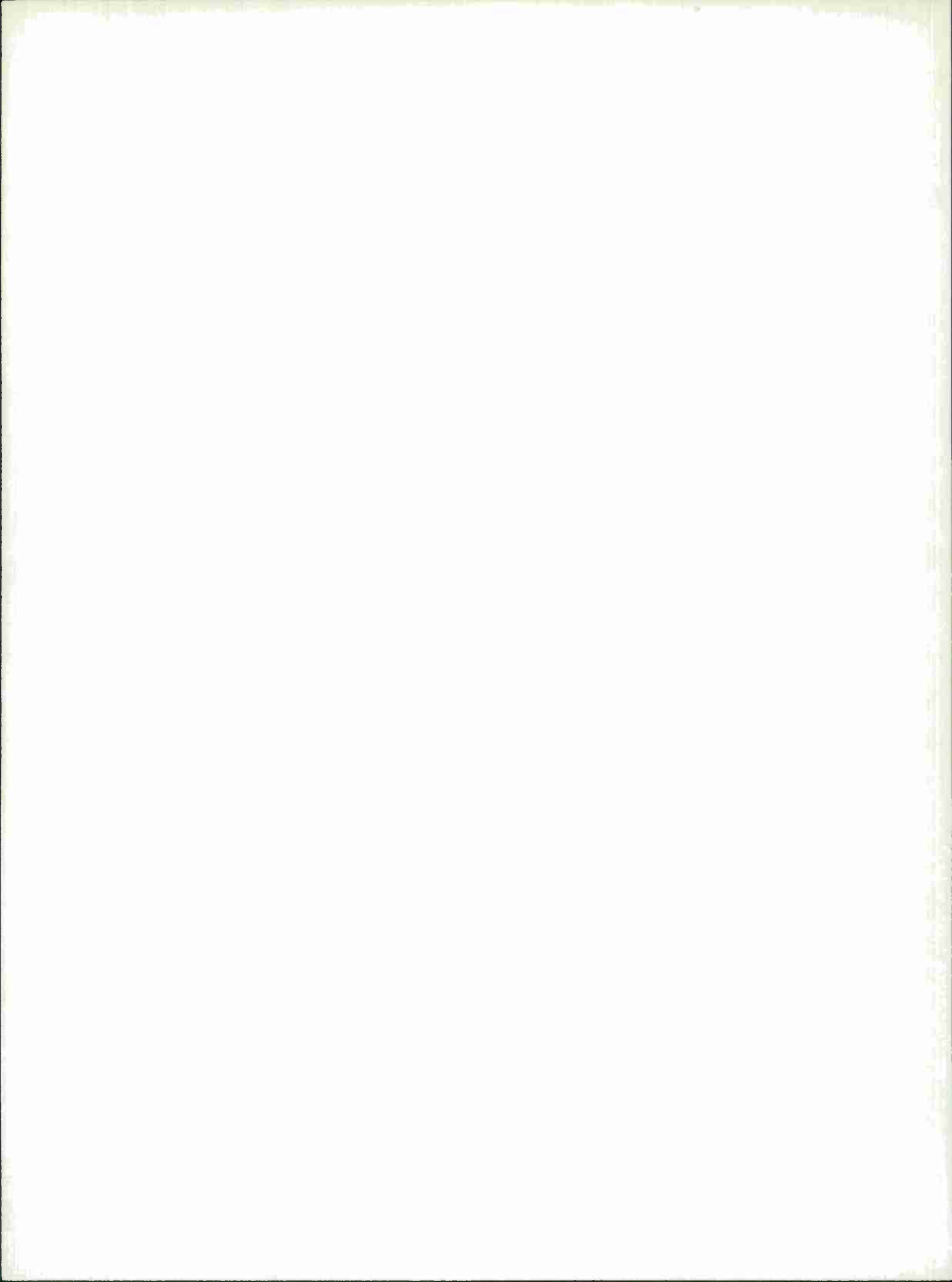
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FOREWORD

This is Volume I of a three-volume final report prepared by the Information Systems Division of Planning Research Corporation, Los Angeles, California, under contract number AF 19(628)-5988, project number 7990. The Air Force Project Officer was Major George H. Montague, Electronic Systems Division, ESLT. Work on the project was performed under the direction of Alan J. Gradwohl, PRC Project Manager, from 16 February 1966 to 15 December 1966, with Stanton H. Wong in charge of producing the final report.

This technical report has been reviewed and is approved.


GEORGE H. MONTAGUE
Major, USAF
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Technology

ABSTRACT

This is Volume I of a three-volume final report that covers Phase II of a three-phase project on the Use of Air Force ADP Experience to Assist Air Force ADP Management. In Phase I, a feasible concept and preliminary approach to using experience was synthesized; in Phase II, the approach was refined, the concept was validated, and the potential use of experience was broadened; and in Phase III, the improved and expanded approach will be implemented Air Force-wide.

Volume I of the final report covers the history of the project; conclusions on Phase II and recommendations for Phase III; and summaries of Phase III activities, Phase III concept and plan, and the pilot version of the ADP Experience Handbook and Primer. Volume II reviews the four major activities of Phase II: data collection, data analysis, ADP Experience Handbook development, and Phase III planning. Volume III presents the detailed Phase III operational concept and development plan followed by a summary of cost and benefits.

This is Volume I, which summarizes the entire Phase II project. The history of the project is traced and the objectives, findings, conclusions, and recommendations are summarized and tabulated. The conclusions are as follows: that sufficient data can be collected to permit macrodescription of an ADPS; relationships do exist between workload descriptors and costs; the information can be distilled and organized into an indexed ADP Experience Handbook; and, for Phase III, an Air Force ADP Management Information System is necessary, feasible, and cost effective. The implementation of Phase III is recommended.

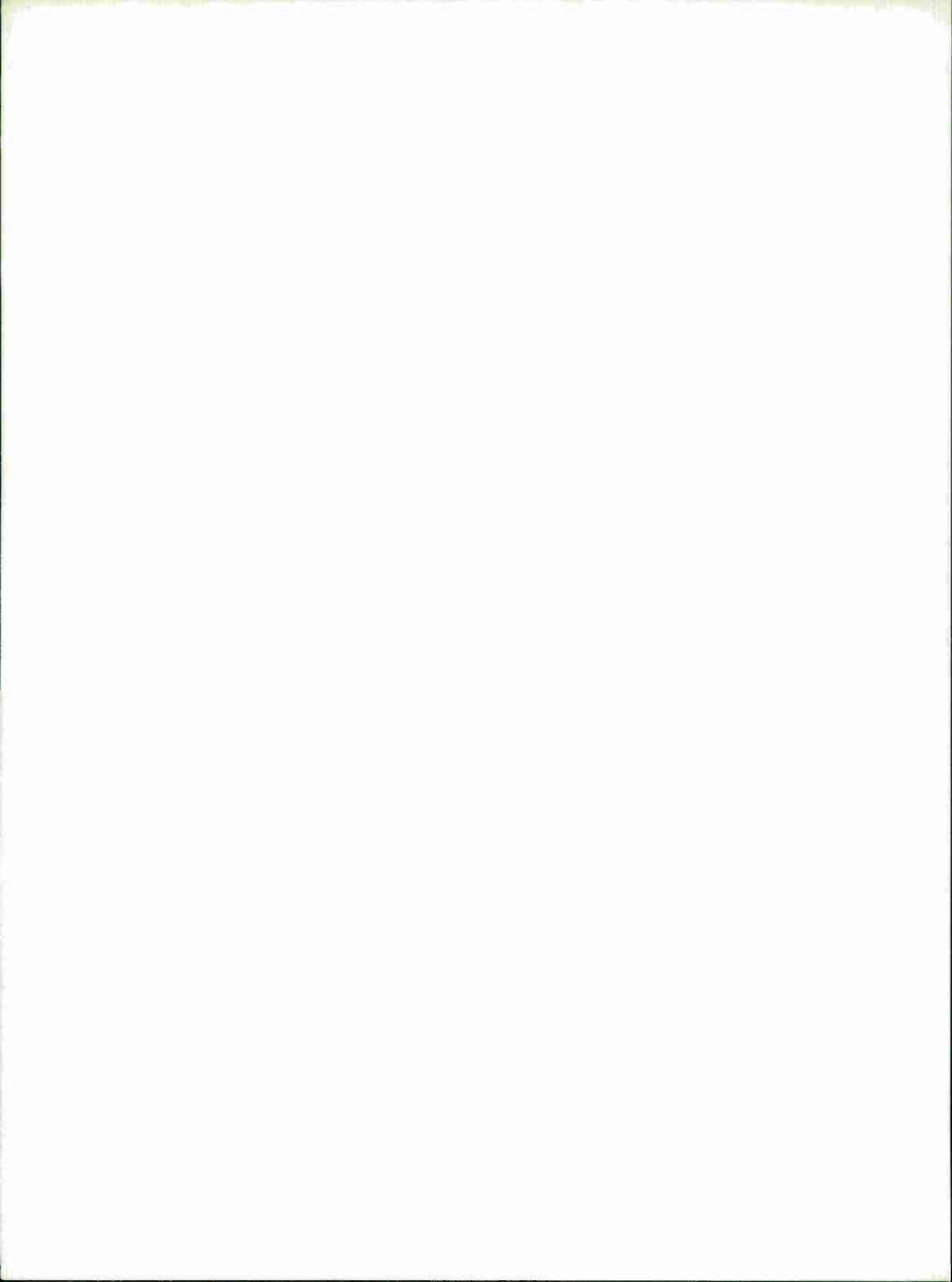


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I. INTRODUCTION

This is Volume I of a three-volume final report that marks the completion by Planning Research Corporation of a research study on the Use of Air Force ADP Experience to Assist Air Force ADP Management. The study is the second phase of a three-phase project; Phase II is to validate and refine concepts developed in Phase I and to develop an operational concept and plan for implementation in Phase III.

The purpose of the final report is to present the objectives, activities, findings, and conclusions of Phase II and to submit an operational concept and development plan for Phase III. These are reported in Volume II and Volume III, respectively. In addition, the pilot version of the ADP Experience Handbook and a Primer that serves as an elementary text for training potential users of the handbook are produced as two separate volumes distinct from this final report (refer to PRC documents R-930 and R-931).

The purpose of Volume I is to provide a concise summary of the activities and products of Phase II along with a consolidation of the conclusions and recommendations. This volume is directed to those audiences that desire a succinct overview of the project to date. For further details, the reader should consult the specific volumes indicated previously.

This volume begins by tracing the history of the project from conception to date. The conclusions and recommendations of Phase II are then presented. The final three sections summarize the four major Phase II activities of data collection, data analysis, Phase III planning, and Experience Handbook development; the Phase III preliminary design and development plan and cost benefits analysis; and the ADP Experience Handbook and Primer.

II. HISTORY OF PROJECT

This section traces the history of the project from its genesis to the present. The history is divided into Pre-Phase I, Phase I, Between Phases I and II, and Phase II. Particular emphasis is placed on the evolution of objectives as PRC gained increasing knowledge of Air Force ADP policies and problems.

A. Pre-Phase I

The impetus for this project came directly from the Secretary of the Air Force in 1964. A need was recognized for a frame of reference and specific criteria to guide future applications, design, development, and procurement of ADP systems for the Air Force. This need for guidelines arose because expanding technology and an increased awareness of the potential of ADP was stimulating the generation of requirements for further ADP (over the next 2 or 3 years, the Air Force computer inventory was expected to increase 50 percent.) These requirements, being extremely dynamic and uncertain, were often giving rise to precipitant and costly adoptions of ADP as a compromise solution selected from among many alternatives. It was realized that guidelines for controlling the process could come from a study of applications, effectiveness, and problems in the rich body of Air Force ADP experience.

Accordingly, the Electronic Systems Division published request for proposal number ES-4-SL-40827, Study of Applications, Effectiveness and Problems of Air Force Information Processing Systems (1 July 1964). The request outlined a two-phase approach to the study: Phase I was essentially a 3-month effort to define in detail the approach to be taken in Phase II; Phase II comprised a 10-month effort consisting of data collection, analysis, and evaluation of the cost and effectiveness of one or more selected classes of ADP systems. The Phase I study was awarded to two contractors, PRC and another contractor, with identical work statements. The contractor with the most promising approach was to be awarded Phase II.

B. Phase I

Work commenced on Phase I on 15 December 1964 and terminated on 14 March 1965, with publication of ESD-TR-65-277, a technical report entitled Use of Air Force ADP Experience in Judging Proposals for New Automation.

Following discussion with Air Force personnel, Phase I evolved into synthesis of an approach to providing summarized ADP experience information to Air Force decision-makers for support of the review/decision process applied to proposals for new automation. The information would be structured for use at a high level in Headquarters, USAF, and would aid more in early planning decisions, such as whether or not to automate, rather than in later implementation decisions, such as which

equipment configuration to procure. During Phase I, as detailed subsequently, an approach to organization, retrieval, presentation, and use of ADP experience in making such decisions was devised; the objectives of Phase II were then set and the activities required to accomplish the objectives were specified.

1. Organization and Retrieval of Experience Information

To be useful at Headquarters, USAF, Phase I theorized, ADP experience information would have to be highly distilled, organized, and retrievable; in addition, it must cover the total ADPS in macrofashion. The need for a macroapproach in the treatment of ADP experience information was highlighted by the prevalent concentration on hardware characteristics during the proposal review/decision process. Hardware accounts for less than half the cost of an ADPS and for far fewer than half of the subsequent problems.

The key to retrieving experience information was determined to be workload--that is, quantitative measures of information processed--as a consequence of the following factors:

- o Workload is a direct causal factor for cost and development time
- o Workload is amenable to quantitative measurement
- o Workload should be available in a proposal for an ADPS, if a thorough analysis of the problem precedes proposal submission

Forty numerical workload descriptors were advanced in Phase I as those most intuitively appealing in satisfying the three criteria. During Phase II, these descriptors were to be analyzed and evaluated by statistical techniques on sampled ADP systems to determine the relationships between ADPS workload descriptors and ADPS cost and development time and to refine those relationships to a well-defined, sensitive, and small set of workload descriptors.

Using workload, the Phase I effort theorized, one could retrieve ADP experience information relevant to a proposed automation. The information would be organized by ADPS into broad-scale macro-descriptions covering cost and development time, information flow, activities and operations, equipment, and personnel.

2. Presentation of Experience Information

Phase I recommended that ultimately (in Phase III) experience information should be presented in the form of a periodic publication called an "Experience Handbook." This publication might itself be supported by an ADPS that would maintain an updated experience information

file for all Air Force ADP systems. Phase II would produce a pilot version of this handbook to validate the concept.

The handbook would contain three principal types of information. The first type would comprise summarized, system macro-descriptions of each Air Force ADPS. The second would be summary statistics across systems, probably in the form of graphs of various workload descriptors versus various cost and development time components. The third type would be an index, based on workload descriptors, that would facilitate retrieval of relevant experience from the macro-descriptions.

3. Use of Experience Information

The handbook would be used by high-level Air Force management in reviewing proposals for new automation. These proposals would contain requirements for the new ADPS, expressed in terms of workload descriptors, and estimated costs and development times. Relevant costs and development times from Air Force ADP experience would be retrieved from the handbook with the aid of the workload descriptors from the proposed ADPS. The proposed costs and development times would be compared with retrieved costs and development times to determine whether the proposed ones are consistent with Air Force experience. In addition, relevant evaluations and problems would be retrieved from the handbook and factored into the comparison. Results of the comparison would then be weighed against Air Force criteria for acceptance or rejection of new automation.

4. Overall Objectives of Phase II

The Phase I effort set the overall objectives of Phase II to validate and refine the approach synthesized for organizing, retrieving, presenting, and using ADP experience in the ADPS proposal review/decision process. These objectives were as follows:

- o To validate that sufficient data can be collected to permit macrodescription of an ADPS
- o To validate that relationships exist among workload descriptors, cost, and development time
- o To produce a pilot version of the Air Force ADP Experience Handbook
- o To derive an operational concept and development plan for Phase III and perform a cost and benefits analysis

5. Activities of Phase II

The Phase I effort also specified the activities required during Phase II to accomplish the stated overall objectives. The following activities were specified:

- o Collect and reduce data from 18 Air Force ADP systems, including 12 management supporting, 3 operations supporting, and 3 research and development supporting systems
- o Statistically analyze the collected and reduced numerical data
- o Convert the collected and reduced data into 18 ADPS macrodescriptions and combine with the cost estimating relationships into a usable handbook
- o Construct a Phase III operational concept and development plan after gathering information from Headquarters, USAF, and perform a cost and benefits analysis

C. Between Phases I and II

The Air Force deliberated on the merits of the approaches to Phase II proposed by PRC and the other contractor. The PRC approach was selected as the one holding the most promise of success, and Phase II was awarded to PRC.

D. Phase II

Work commenced on Phase II on 16 February 1966 and terminated on 15 December 1966, with the publication of the following final documentation:

- o Phase II Final Report on Use of Air Force ADP Experience to Assist Air Force ADP Management
 - a. Volume I: Summary, Conclusions, and Recommendations (this volume)
 - b. Volume II: Phase II Activities
 - c. Volume III: Phase III Concept and Plan
- o Air Force ADP Experience Handbook (Pilot Version)
- o Primer for Air Force ADP Experience Handbook (Pilot Version)

The summary of Phase II is the subject of the remainder of this volume; the technical content of Phase II is detailed in Volume II of this report. One item of historical interest is worthy of mention, however. This is the change in title of the project from "Use of Air Force ADP Experience in Judging Proposals for New Automation" to "Use of Air Force ADP Experience to Assist Air Force ADP Management." This change reflects a change in emphasis given to the Phase III planning

midway through Phase II. The change occurred after interviews with Air Staff personnel revealed that the problem of ADP management in the Air Force is much broader than previously envisioned and that the ADPS proposal review/decision process is much more complex. The scope of Phase III was expanded to obtain better proposal, experience, and ADP asset information than currently available. The expanded scope was also seen to be useful in providing management information to Headquarters, USAF, for assistance in the following areas:

- o Efficient utilization of ADP assets
- o Effective prosecution of the ADP standards program
- o Closer monitoring of on-going ADPS developments and operational systems
- o Improved ADP budget forecasting
- o Performance of special studies of ADP

III. CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions and recommendations of Phase II, traced logically through their roots in the Phase II objectives, activities, and findings. The objectives, conclusions, and recommendations are presented first, followed by a summary chart showing the complete flow of reasoning from objectives, through activities, findings, and conclusions, and culminating in recommendations. The summary chart supports the logic involved in arriving at the conclusions and recommendations.

A. Objectives

The following objectives of Phase II were determined in Phase I:

- o To validate that sufficient data can be collected to permit macrodescription of an ADPS.
- o To validate that relationships exist among workload descriptors, cost, and development time.
- o To produce a pilot version of the Air Force ADP Experience Handbook.
- o To derive an operational concept and development plan for Phase III and perform a cost and benefits analysis.

B. Conclusions

The conclusions of Phase II directly answer the objectives:

- o Sufficient data can be collected to permit macrodescription of an ADPS.
- o Relationships definitely do exist between workload descriptors and costs.¹
- o The Air Force ADP Experience Handbook will be a useful management tool.
- o Phase III, which will feature development and operation of an Air Force ADP Management Information System embodying the Experience Handbook, is both feasible and cost effective.

¹ Direct relationships between workload descriptors and elapsed development time were not discovered with the 18-ADPS sample. A larger sample in Phase III should reveal these relationships because they probably exist. One of the costs predictable through workload descriptors is, however, man-months of development effort. Knowing the number of personnel to be assigned to an ADPS development, one can derive elapsed development time from the man-month estimate.

C. Recommendations

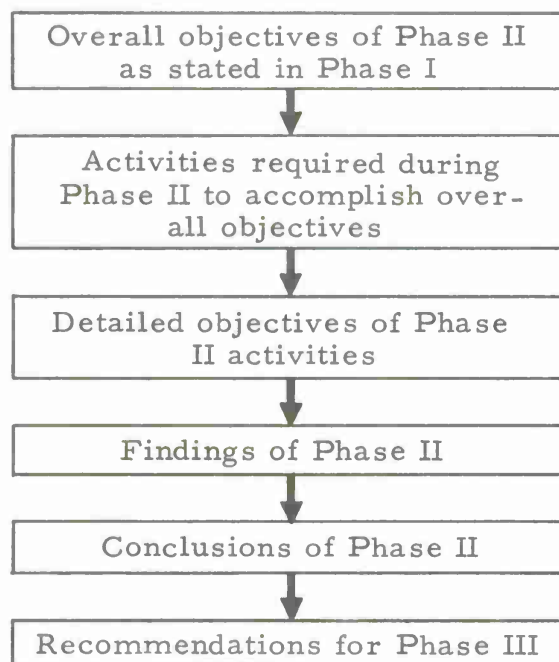
There is only one recommendation, and it follows directly from the conclusions:

The Air Force should continue the project into Phase III and develop and operate an Air Force ADP Management Information System.

This single recommendation embodies a number of subrecommendations which have been incorporated in the concept of the ADP Management Information System. Among these are included a more stringent ADPS proposal preparation instruction and the orderly accumulation of a considerably wider range of ADP experience and asset data than is now accumulated at Headquarters, USAF.

D. Support for Conclusions and Recommendations

The conclusions and recommendations were not derived in a precipitant fashion; rather, they follow naturally from the activities and findings of Phase II. The flow of reasoning from objectives to recommendations takes the following path:



The chart presented in Figure 1 summarizes Phase II in this framework. The reader is urged to follow the logic in the chart, starting from the upper left corner (first overall objective), tracing up and down to the lower right corner (recommendation). The row containing the findings of Phase II will be of particular interest because the many discoveries that lead directly to the conclusions are enumerated therein.

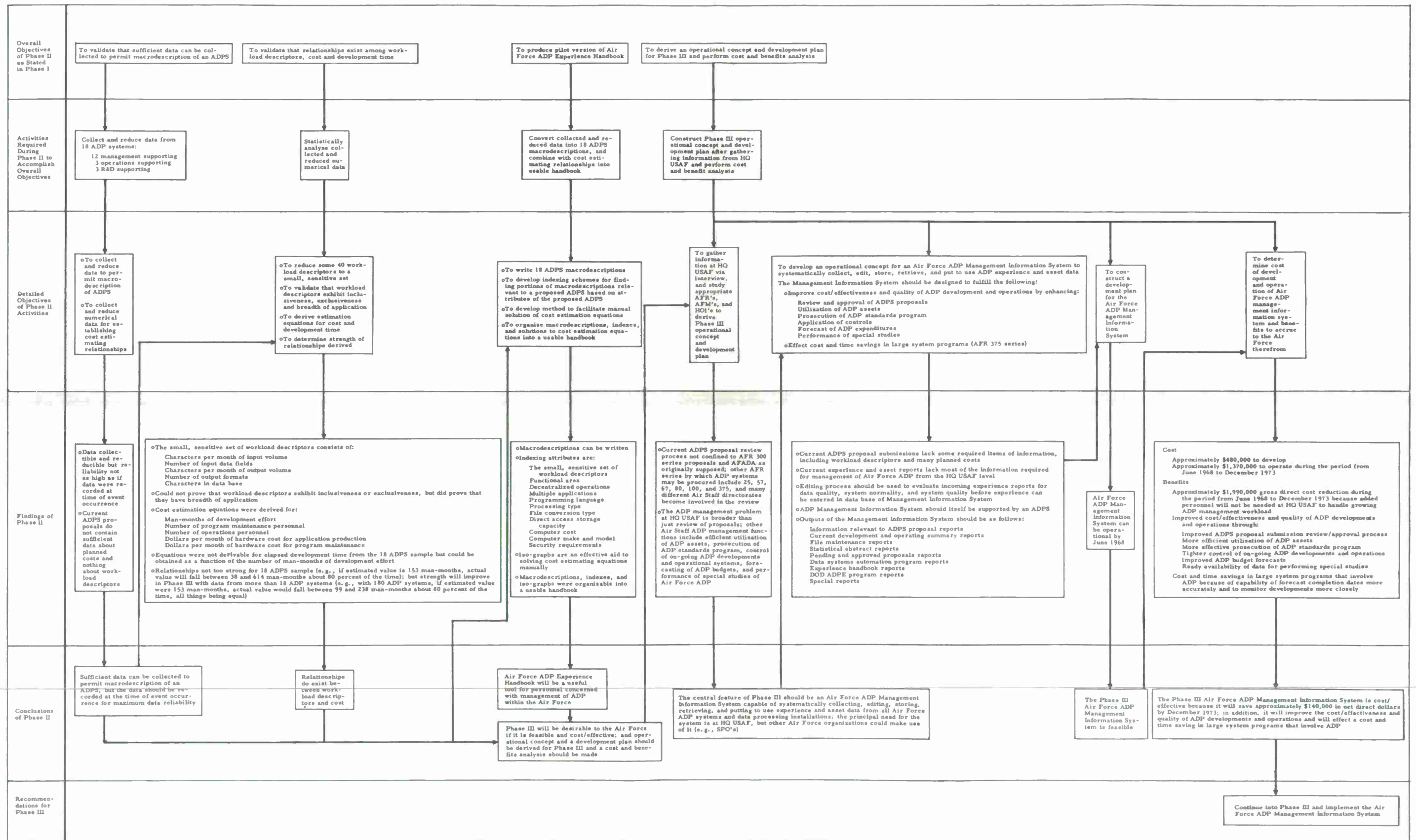


FIGURE 1 - SUMMARY OF PHASE II OBJECTIVES, ACTIVITIES, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

IV. PHASE II ACTIVITIES

This section summarizes the four major activities of Phase II: data collection, data analysis, Experience Handbook development, and Phase III planning. These activities are explained in greater detail in Volume II of this report.

A. Data Collection

The objectives of data collection were to collect and reduce data from 18 ADP systems to permit macrodescriptions and to establish cost estimating relationships. These objectives were met by developing models to guide the collection and reduction of data.

An ADPS model was developed to serve as a basis for the preparation of macrodescriptions. The concept developed for the total ADPS is based on the evolution of an ADPS over four time periods: proposal phase, development phase, operations phase, and future plans. The workload model advanced in Phase I was redefined to serve as a basis for retrieving experience information from the system descriptions and for the derivation of estimating relationships among workload descriptors and cost and development time.

The data collection questionnaire was developed on the basis of the ADPS and workload models and data were collected for an 18-ADPS sample. The sample was stratified into four system types: six management supporting--logistics systems; six management supporting--personnel/finance systems; three operations supporting systems; and three research and development supporting systems. The sample was further grouped into three system sizes: large, medium, and small.

The findings were that sufficient data were collectible and reducible, but the reliability of the data was not as high as if they were recorded at the time of event occurrence. Furthermore, current ADPS proposals do not contain sufficient data pertaining to planned costs, and almost nothing is included about workload descriptors.

B. Data Analysis

The objectives of data analysis were to reduce the number of workload descriptors in the workload model to a small, sensitive set; to derive estimation equations for cost and development time; and to determine the strength of the relationships derived.

The workload model was further refined by determining and selecting the relevant planning factors to be estimated and the workload descriptors to be used as predictors. Scatterplots and correlation analysis were used to refine this set to a cost model, and regression analysis was then applied to derive the cost estimation equations. The resulting small, sensitive set of workload descriptors used in the equations consisted of:

- o Characters per month of input volume
- o Number of input data fields
- o Characters per month of output volume
- o Number of output formats
- o Characters in data base

Cost estimation equations were derived for the following planning factors:

- o Man-months of development effort
- o Number of program maintenance personnel
- o Number of operations personnel
- o Dollars per month of hardware cost for application production
- o Dollars per month of hardware cost for program maintenance

Equations were not derivable for elapsed development time from the 18-ADPS sample; however, they can be obtained as a function of the number of man-months of development effort. Because of the sample size of only 18 ADP systems, the relationships discovered were not too strong. If the sample size were increased ten times (as it will be in Phase III), the relationships would be considerably strengthened. See the column on Findings of Phase II in Figure 1 for a numerical example.

C. Experience Handbook Development

The objectives for the development of the ADP Experience Handbook were to write macrodescriptions for the 18 ADP systems, to develop indexing schemes for finding portions of macrodescriptions relevant to a proposed ADPS based on the attributes or workload descriptors of the proposed ADPS, to develop a facile means for obtaining the solutions to the cost estimation equations, and to organize all of these into a usable handbook.

Iso-graphs were developed for solving the five sets of cost estimation equations; these graphs proved easy to use. Macrodescriptions were written for each of the 18 ADP systems by distilling the data collected into quantitative and graphical forms whenever possible.

An indexing scheme was developed to retrieve relevant information from the system descriptions. A "how to use" section and a glossary were added, and all were organized as the ADP Experience Handbook.

In addition, a Primer was written and published as a separate volume. The Primer is an elementary text to be used for training potential users of the handbook on how to prepare ADPS proposals and how to evaluate them. A sample ADPS proposal is included. A description of the handbook and primer is presented in Section VI of this volume.

D. Phase III Planning

The activities of Phase III planning led to the discovery that the ADPS proposal review process was more complex and the ADP management problem was broader than originally envisioned. Hence, the scope of Phase III was enlarged and the operational concept and development plan that was produced reflected this requirement. Section V of this volume presents a summary of the concept and plan, together with an analysis of the costs and benefits.

V. PHASE III CONCEPT AND PLAN

This section presents the operational concept and plan for Phase III along with a cost/benefits analysis. As Phase III planning got underway, it became quite evident that the scope of the task was much wider than originally envisioned. The types of ADPS proposals arriving at Headquarters, USAF, for approval were many, as were the number of organizations within the Air Staff that were involved in the evaluation process. It was also determined that the amount and type of ADP information reported to Headquarters, USAF, on ADPS developments and operations were insufficient for their needs if the best management techniques were to be applied to the ADP management problem.

Accordingly, the concept established for implementation in Phase III was one of a complete ADP Management Information System (MIS) with the goal of serving all parts of the Air Staff involved in the entire life cycle of an ADPS (proposal, development, operation).

The two primary objectives of the MIS are as follows:

- o To improve the cost effectiveness and quality of ADPS development and operations in the Air Force
- o To effect a cost and time saving in larger systems in which ADP may play only a small part compared with overall system costs

The first objective calls for better accuracy, completeness, and timeliness of ADP management information at Headquarters, USAF, so that the appropriate organizations may more effectively prosecute a number of phases of ADP management. These phases of ADP management at Headquarters, USAF, include review, evaluation, and approval/disapproval of ADPS proposals; efficient utilization of ADP assets; prosecution of an effective ADP standards program; application of controls to on-going ADP developments and operational systems; accurate forecasting for ADP expenditures in the Air Force budget; and performance of special studies on various aspects of Air Force ADP.

The second objective applies the same concepts just described to larger systems in which ADP plays only a part. In such systems (e.g., AFR 375 series developments), the cost of data processing is often small compared to overall system costs, but unfortunately the ADP effort almost always lies on the critical path (in a PERT sense). Any variations in completion time can cause very large costs and slippages for all paths downstream. The largest cost savings to be afforded by the proposed MIS, therefore, could easily be in better control of ADPS developments imbedded in large systems. Not to be overlooked, of course, is the increased probability that a critical military system will not be delayed in becoming operational.

Figure 2 gives a general picture of the overall information flow within the Management Information System. The greatest majority of the data enters the system in the form of periodic reports from ADP users in the field. A staff of editors peruses the experience and asset reports for compliance and reasonableness, and, when appropriate, adds comments, explanations, and evaluations. This information, together with information concerning ADPS proposals and cost estimation equations, forms the data base of the Information Storage and Retrieval System. Various reports, as indicated in the figure, are available periodic and special-request basis.

Estimates of the system's workload, discussed in detail in Volume III, show that 2 years after the system is operational, the workload will be about 1,000,000 characters per month of input volume for data base update, about 7,000,000 characters per month of output volume for reports, with a data base of about 11,000,000 characters.

Estimates of personnel and computer time requirements for operation of the system have also been made. In summary, these are the following:

	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
Man-Years Per Year	11.9	25.1	28.1	30.1	32.3	34.5
Computer Hours Per Month ¹	9.3	14.7	18.1	21.6	25.4	27.6

It is predicted that the MIS will cause a reduction in personnel required at Headquarters, USAF, of some 75 man-years per year by 1973. Converting these figures to dollars (using a direct salary average of \$8,000 per year, and an estimate of \$50 per hour for computer time) and plotting savings versus costs, including \$480,000 of development costs, indicates that the system will more than pay for itself in 7 years. (See Figure 3.) This does not even include the more significant savings possible through better management of large system programs, better equipment utilization, etc.

A plan for developing the MIS has been devised and is presented in detail in Volume III. The plan calls for the system being operational in approximately 18 calendar months. This includes the training required for the Air Force to maintain, operate, and use the system. The development plan includes, in addition to design and development of the information storage and retrieval system, the design of new ADP experience reporting procedures, new ADPS proposal procedures, and new ADP assets reporting procedures.

¹ Assumes a computer of the approximate computing speed and I/O speeds of an IBM 1401.

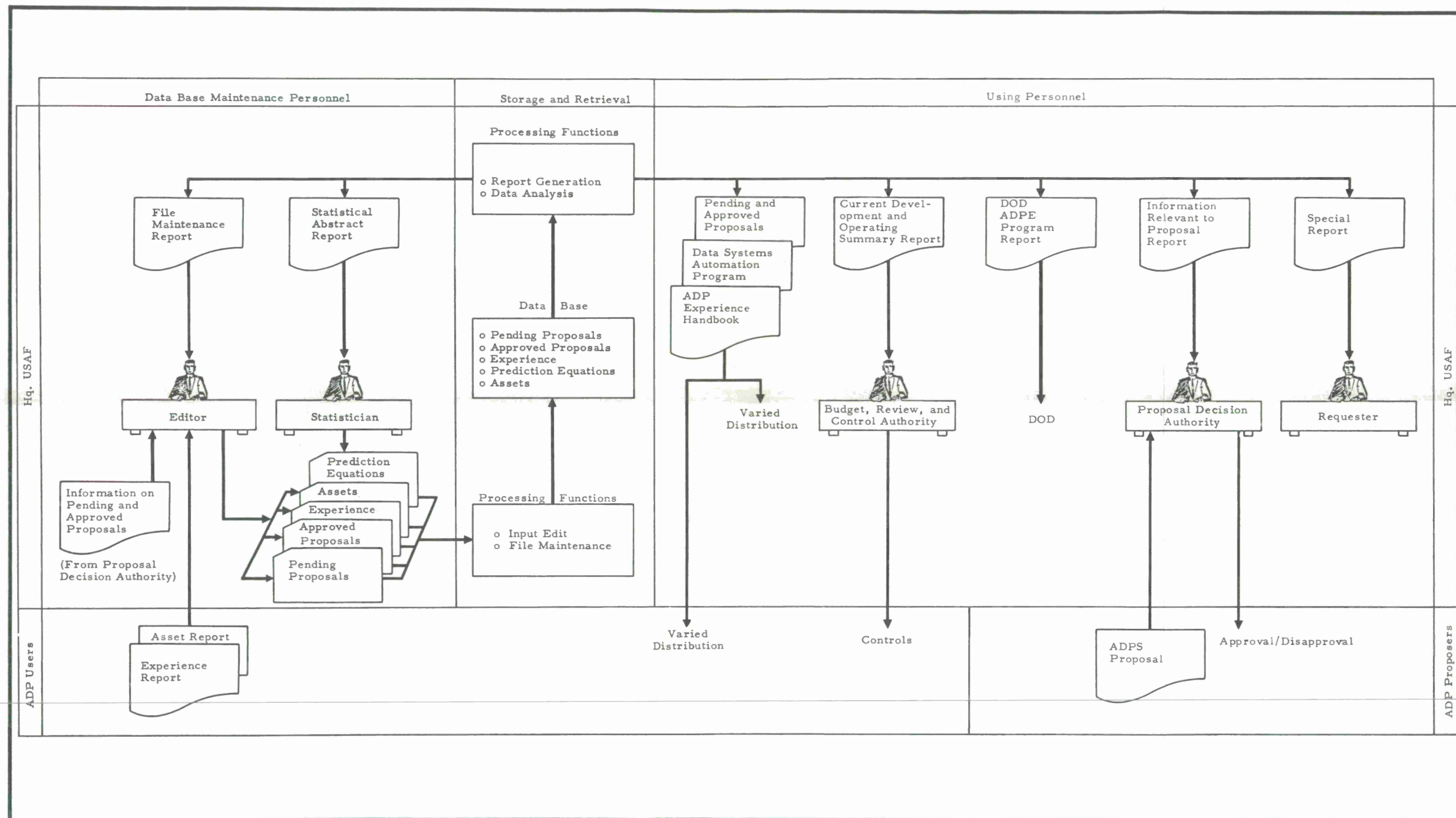
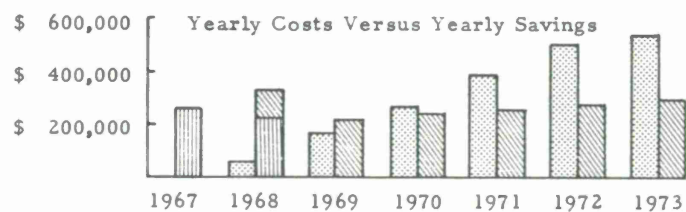
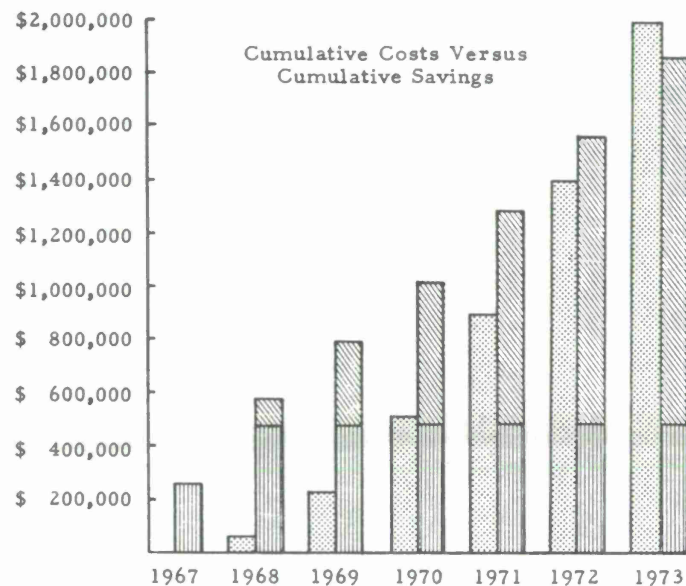


FIGURE 2 - INFORMATION FLOW OF AIR FORCE ADP MANAGEMENT INFORMATION SYSTEM

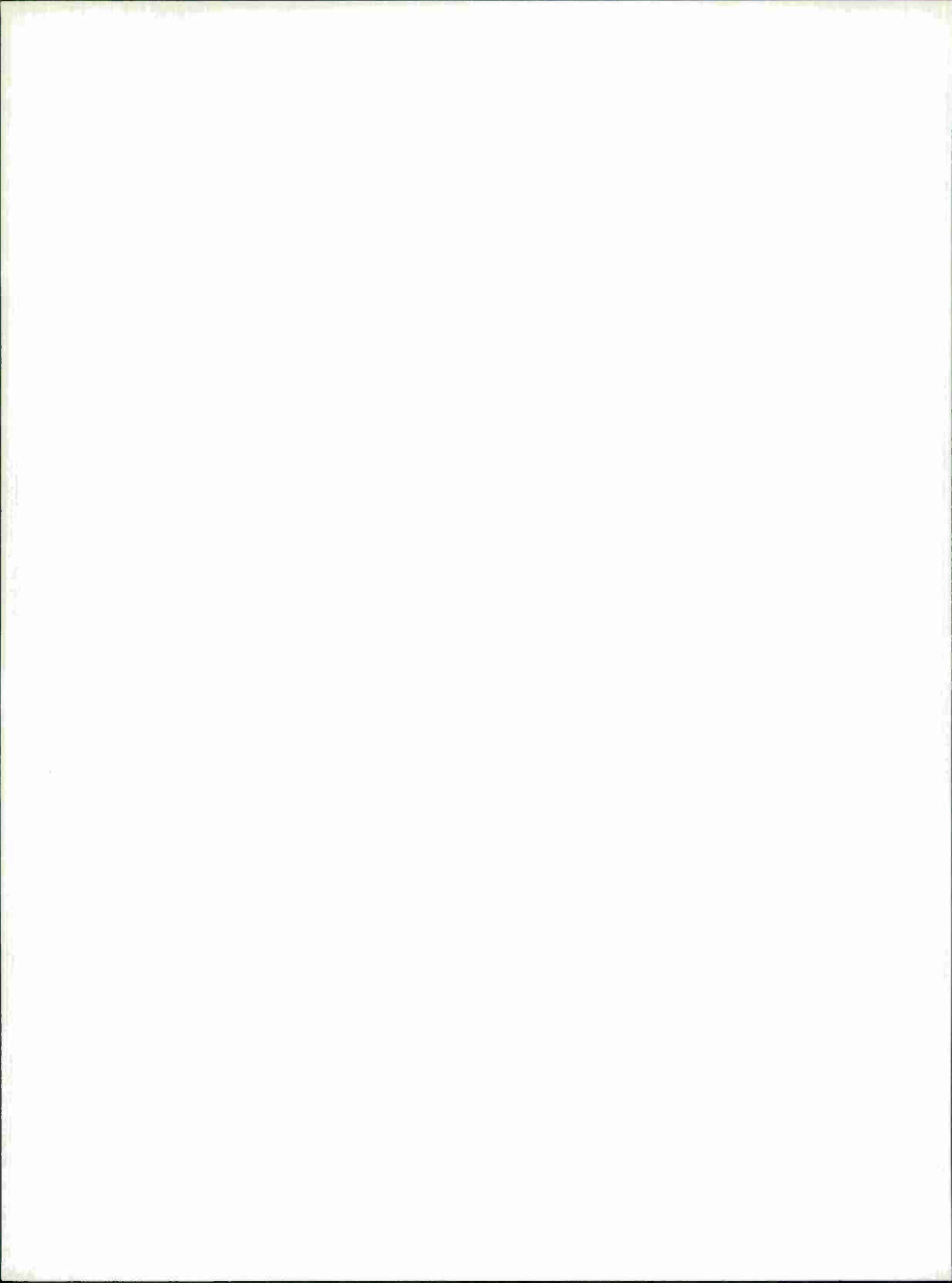


 Development Cost
 Operations Cost
 Savings

Benefits

1. Cost savings as shown.
2. Improved cost/effectiveness and quality of Air Force ADP development and operations through:
 - a. Improved ADPS proposal submission/review/approval process
 - b. More efficient utilization of ADP assets
 - c. More effective prosecution of ADP standards program
 - d. Tighter control of on-going ADP developments and operations
 - e. Improved ADP budget forecasts
 - f. Ready availability of data for performing special studies
3. Cost and time savings in large system programs that involve ADP, because of capability to forecast completion dates more accurately and to monitor developments more closely.

FIGURE 3 - SUMMARY OF COSTS AND BENEFITS



VI. ADP EXPERIENCE HANDBOOK AND PRIMER

This section provides summary descriptions of the Air Force ADP Experience Handbook and the Primer for its use. These products are presented in two volumes as PRC documents R-930 and R-931, and are not part of the final report.

The Air Force ADP Experience Handbook (Pilot Version) was developed to determine techniques for presenting and retrieving ADP experience data, and to acquaint Air Force ADP management personnel with the use of highly summarized and organized ADP experience in reviewing ADPS proposals. The structure of the handbook should be regarded as indicative of the way experience data may be structured and presented, and not as a firm mold for presentation of all experience data collected in the future. Furthermore, the pilot version of the handbook contains data collected after the fact from only 18 ADP systems, and hence the handbook has limited usefulness for actual evaluation of ADPS proposals. It does, however, contain some cost estimation equations and narrative experience that will be useful until a handbook with more systems can be produced in Phase III.

A. Air Force ADP Experience Handbook (Pilot Version)

The handbook is organized into five major sections, as outlined below.

1. Use of Experience Handbook

This section describes procedures for using cost estimation iso-graphs to obtain cost estimates and for using indexes to retrieve relevant experience from system descriptions.

2. Cost Estimation Iso-Graphs

This section contains 15 iso-graphs, 1 for each of the 3 values to be estimated for the following cost factors:

- o Man-months of development effort
- o Number of program maintenance personnel
- o Number of operations personnel
- o Dollars per month of hardware cost for application production
- o Dollars per month of hardware cost for program maintenance

For example, an iso-graph for the expected value of man-months of development effort is used by entering a graph on the X-axis with

the proposed value of number of input data fields and on the Y-axis with the proposed value of number of output formats, and by noting the intersection on the graph in relation to a set of iso-lines (lines connecting equal values of man-months of development effort, analogous to iso-bars on a weather map).

3. System Descriptions

This section contains 18 macrolevel descriptions of Air Force ADP systems. The system descriptions are highly formatted and comprise the following sections:

- a. System
- b. Data System Designator
- c. Data Collection Date
- d. Location
- e. Function
- f. Organization
- g. History
- h. Schedule
- i. Description
- j. Workload
- k. Hardware
- l. Software
- m. Application Program Development
- n. File Conversion
- o. Documentation
- p. Personnel
- q. Operations
- r. Application Program Maintenance
- s. System Benefits
- t. Cost Factors
- u. Future Plans

4. Glossary

The glossary comprises two major sections. The first section gives definitions of Air Force and data processing terms and abbreviations used throughout the handbook. The second section gives definitions for the workload descriptors and cost factors.

5. Indexes

There are 12 different indexes the user can exercise in retrieving experience from the 18 system descriptions, each index requiring information from the proposal to set its value. The indexes are as follows:

- a. Workload descriptors related to development experience

- b. Workload descriptors related to operations experience
- c. Functional area
- d. Centralized or decentralized operations
- e. Single or multiple applications on computer
- f. Programming language
- g. Type of processing (e.g., batch, real-time, etc.)
- h. File conversion type (e.g., manual to ADP, PCAM to ADP, etc.)
- i. Direct access storage capacity
- j. Computer cost
- k. Computer make and model
- l. Security requirements

Each index retrieves a unique subset of 21 sections. Indexes c through l are discrete; e.g., the centralized or decentralized operations index breaks down into (1) single installation, (2) 2 to 7 installations, (3) 8 to 100 installations, and (4) more than 100 installations. The first two indexes, however, the ones involving workload descriptors, are best presented in a continuous fashion; e.g., the number of input data fields for each of the 18 ADP systems is indicated along a continuous log scale from 10 to 10,000. Relevant systems are selected by placing a transparent slider at the proposed values of the workload descriptor for that index and by noting all systems that fall in a range indicated on the slider. According to its proximity to the proposed value, a selected ADP system is assigned a numerical rank. These ranks, along with those determined with other workload descriptors, are totaled in a ranking table. The ADP systems with the highest numerical ranks are those most relevant to the proposed ADPS.

B. Primer for ADP Experience Handbook (Pilot Version)

The primer is designed to show by example the preparation and evaluation of a sample ADPS proposal. The primer comprises the following four sections:

1. Introduction

The introductory section describes the goals and organization of the primer.

2. ADPS Proposal Submission Instruction

This section describes the information that should be contained in an ADPS proposal. It is similar to the DAP Submission Instruction from AFR 300-3; however, it includes additional instructions for providing explicit information on workload descriptors and cost factors.

3. Sample ADPS Proposal

This section is a hypothetical ADPS proposal for a military pay system, centralized at the major air command level. This proposal is written from the standard established by the preceding section. The sample proposal serves as a vehicle for evaluation using the following section.

4. Evaluation of Sample ADPS Proposal

This section applies the handbook to the sample ADPS proposal of the preceding section. Cost estimates based on existing Air Force systems are made and compared with the prepared cost factors. Relevant problems and experience are also retrieved from the handbook. A final summary evaluation and recommendation is made for the sample ADPS proposal.

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13. ABSTRACT <p>This is Volume I of a three-volume final report that covers Phase II of a three-phase project on the Use of Air Force ADP Experience to Assist Air Force ADP Management. In Phase I, a feasible concept and preliminary approach to using experience was synthesized; in Phase II, the approach was refined, the concept was validated, and the potential use of experience was broadened; and in Phase III, the improved and expanded approach will be implemented Air Force-wide.</p> <p>Volume I of the final report covers the history of the project; conclusions on Phase II and recommendations for Phase III; and summaries of Phase III activities, Phase III concept and plan, and the pilot version of the ADP Experience Handbook development, and Phase III planning. Volume III presents the detailed Phase III operational concept and development plan followed by a summary of cost and benefits.</p> <p>This is Volume I, which summarizes the entire Phase II project. The history of the project is traced and the objectives, findings, conclusions, and recommendations are summarized and tabulated. The conclusions are as follows: that sufficient data can be collected to permit macrodescription of an ADPS; relationships do exist between workload descriptors and costs; the information can be distilled and organized into an indexed ADP Experience Handbook; and, for Phase III, an Air Force ADP Management Information System is necessary, feasible, and cost effective. The implementation of Phase III is recommended.</p>		

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
1. Data Processing Systems						
2. Classification						
3. Abstracts						
4. Measurement						
5. Analysis						
6. Effectiveness						
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